

*barrinus* Bram (1967), apparently falls into a distinct complex of closely related forms within the subgenus *Culiciomyia*.

Biology: The adults of *C. ceramensis* were obtained from individual and mass rearings from several larvae and pupae collected from a decayed sago trunk lying on the ground. On another occasion, immatures were collected from a hole in the ground in association with specimens of *C. (Lutzia) halifaxii* Theobald. The biology of the adults is unknown.

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### A NEW SPECIES OF AEDES (STEGOMYIA) FROM THAILAND AND NOTES ON THE MEDIOPUNCTATUS SUBGROUP (DIPTERA: CULICIDAE)<sup>1</sup>

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ABSTRACT—The male, larva and pupa of *Aedes (Stegomyia) malikuli* n. sp., from Thailand are described and illustrated. Notes on the *mediopunctatus* subgroup are given.

Recently, two closely related species of the *Aedes (Stegomyia) mediopunctatus* subgroup were received from Thailand. One is here described as a new species and the other is *perplexus* (Leicester).

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Both species were collected as larvae in the same tree hole from Chiang Mai area. Unfortunately, they are extremely similar and appear to be inseparable in all stages except male terminalia which are strikingly different.

It is considered desirable to describe the new species at the earliest opportunity, and point out once again that closely similar *Stegomyia* species are not infrequently found in the same larval habitat, such as in the same tree hole.

The following notes on the *mediopunctatus* subgroup demonstrate the necessity to confirm identifications by examination of male terminalia, particular care being taken to study the claspette of the basimere. Gaps in our knowledge of this subgroup and the need for material from the entire Oriental region, particularly material from Peradeniya, Ceylon, the type locality of *mediopunctatus* (Theobald), are obvious.

*Aedes (Stegomyia) malikuli*, n. sp.

figs. 1, 2

This species is named for Mr. Vichai Malikul, Scientific Illustrator in the South-east Asia Mosquito Project, in appreciation of his help in making the drawings for my continued studies on the *Stegomyia* mosquitoes.

**MALE. Head.** Proboscis dark scaled, sometimes with a white patch at base and a few pale scales on ventral side, as long as fore femur; palpus dark, slightly longer than proboscis, with white basal band on each of segments 2-5; those on segments 4, 5 incomplete dorsally; segments 4, 5 subequal, slender, upturned, and with only a few short hairs; antenna plumose, shorter than proboscis; clypeus bare; torus covered with white scales except on dorsal side; decumbent scales of vertex all broad and flat; erect forked scales dark, not numerous, restricted to occiput; vertex with a broad median stripe of broad white scales, with broad dark ones on each side interrupted by a lateral stripe of broad white scales followed by a patch of similar scales ventrally. **Thorax.** Scutum with narrow dark scales and a broad median longitudinal stripe of similar white ones which reaches from anterior margin, tapers posteriorly and forks at beginning of prescutellar space; prescutellar space surrounded by white narrow scales; a patch of broad white scales on the lateral margin just before the level of the wing root, extending forward over the paratergite and the mesothoracic spiracle toward scutal angle and backward over the wing root toward scutellum; acrostichal and dorsocentral bristles absent; scutellum with broad white scales on mid lobe and broad dark scales on side lobe, sometimes side lobe with few pale broad scales as well; anterior pronotum with broad white scales; posterior pronotum with broad white scales and a few dark ones dorsally; paratergite with broad white scales; patches of broad white scales on propleuron, on the subspiracular and postspiracular areas, on the upper and lower portions of sternopleuron and on the mesepimeron; lower mesepimeron without bristles; metaneron bare. **Wing.** With dark scales on all veins, sometimes with a minute basal spot of white scales on the costa; first forked cell twice as long as its stem. **Halter.** With dark scales. **Legs.** Coxae with patches of white scales; knee-spot absent on fore femur, present on mid and hind femora;

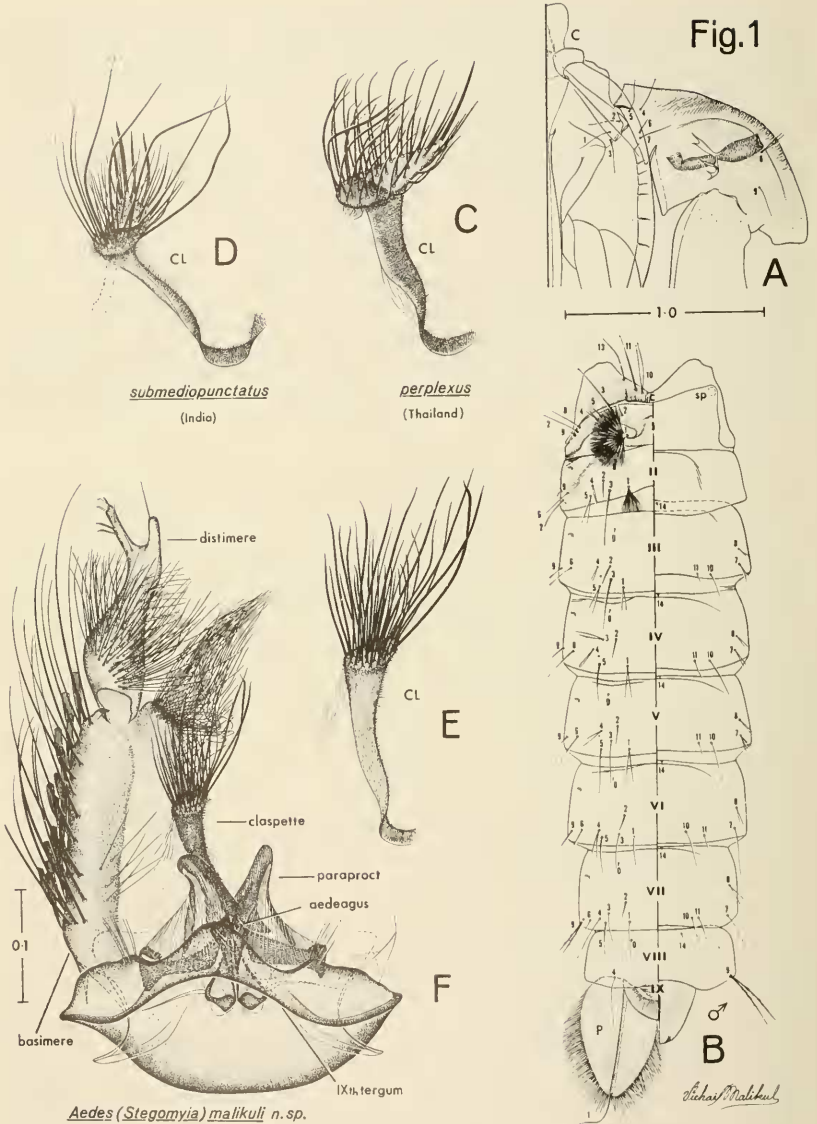


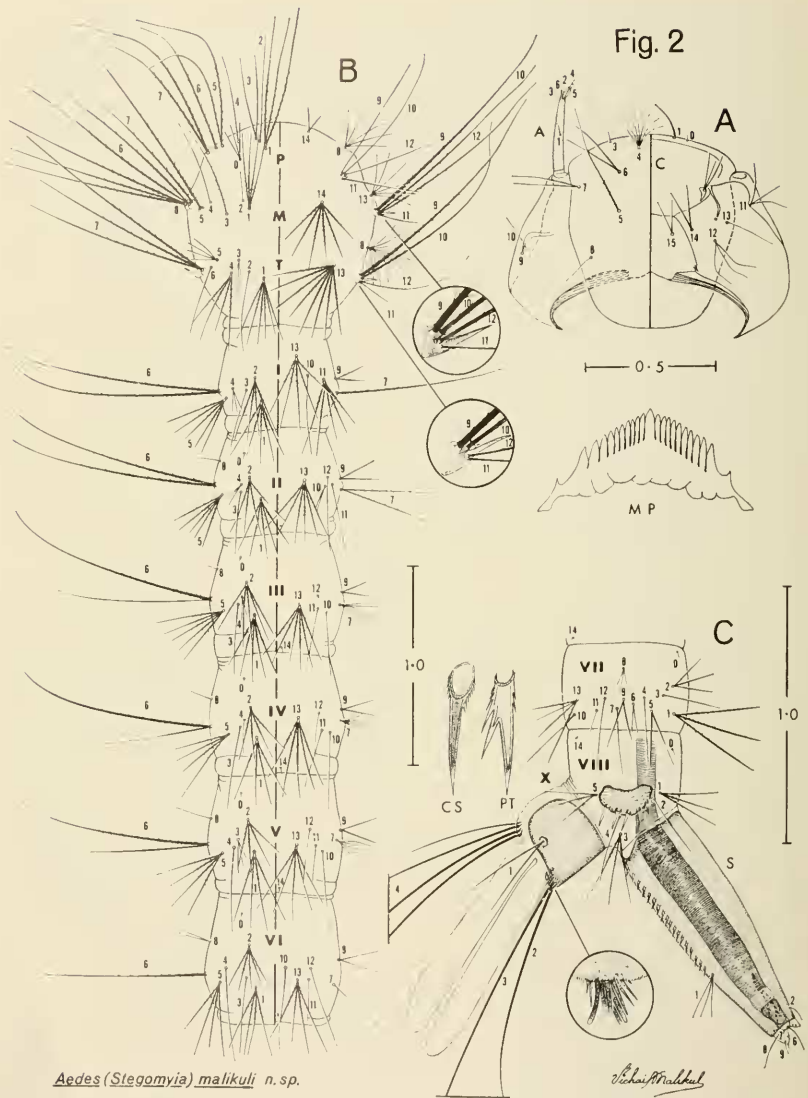
Fig. 1. A, B and F, *Aedes (Stegomyia) malikuli*, n. sp.: A, B, dorsoventral aspect of the male pupa; F, tergal aspect of the male terminalia. C-E, tergal aspects of the claspette: C, A. (*S.*) *perplexus* (Leicester); D, A. (*S.*) *submediopunctatus* (Theobald); E, A. (*S.*) *malikuli*, n. sp.

fore and mid femora anteriorly dark; hind femur anteriorly with basal  $\frac{3}{4}$  white, a complete dark band present which separates the basal white stripe from the apical white scale patch, sometimes the dark band not complete on the lower portion of anterior surface; all tibiae anteriorly dark; hind tibia with white stripe on basal-ventral  $\frac{1}{4}$ ; fore tarsus with basal white band on tarsomere 1; mid tarsus with basal white bands on tarsomeres 1, 2; hind tarsus with basal white bands on tarsomeres 1, 2; tarsomere 3 all dark; tarsomere 4 all white, sometimes dark at tip; tarsomere 5 all dark, sometimes with a few white scales on basal area, or sometimes with basal  $\frac{1}{2}$  white; fore and mid legs with tarsal claws unequal, all toothed; hind leg with tarsal claws equal, simple. *Abdomen*. Abdominal segment I with white scales on laterotergite; terga II-VI with large basal lateral white spots; tergum II with or without a small basal median white spot; terga III-VI each with a basal white band which is not connected with the lateral spots. *Terminalia*. Basimere short and broad, about twice as long as wide; its scales restricted to lateral and ventral areas; with numerous long setae on apicomeresal area; with a patch of hairs (3-10) on basomesal area of dorsal surface; claspette simple, with numerous long setae on the slightly expanded distal part and with few shorter ones on sternal side; distimere complex, expanded at base and forked apically, with hairs and spiniform process; aedeagus with a distinct sclerotized lateral toothed plate on each side; paraproct without ventral arms; cercal setae absent; tergum IX with middle part produced into a large rounded lobe and with a small hairy lobe on each side.

FEMALE. Unknown.

PUPA. *Cephalothorax*. Trumpet short, about 2.5 times as long as wide at the middle; hair 1, 3-C single, slightly longer than 2-C; 2-C single; 4, 5-C single; 6-C single, shorter than 7-C; 7-C single; 10-C 2-branched, mesad and caudad of 11-C; 11-C single, stout. *Abdomen*. Hair 1-I well developed, with more than 10 branches, dendritic; 2-I single; 3-I single, long; 2, 3-I not widely separated, distance between them as distance between 4, 5-I; hair 1-II with many branches, dendritic; hair 2-II laterad of hair 3-II; hair 2-IV, V laterad of hair 1-IV, V; hair 1-III usually with 2 branches (2-4); hair 1-IV usually double (2-3); 3-II, III single, shorter than segment III; 5-IV-VI single, or sometimes 5-IV, V with 2 branches, short, not reaching beyond posterior margin of following segment; hair 9-I-VI small, single, simple; 9-VII 2-branched, barbed; 9-VIII with 2 branches and barbed, reaching beyond fringe of paddle. *Paddle*. Margins with fringe; hair 1-P single.

LARVA. *Head*. Antenna 0.5 length of head, without spicules; 1-A inserted near middle of shaft, single, small, spine-like; inner mouth brushes pectinate at tip; head hair 4-C well developed, with 5-7 branches, closer to 6-C than 5-C, cephalad and mesad of 6-C; 5-C single, long; 6-C double; 7-C with 2 branches; 8, 10 and 13-C single; 9-C with 2 branches; 11-C 3-branched; 12-C with 3-4 branches; 14-C double; 15-C usually double (2-3); mentum with 10-11 teeth on each side. *Thorax*. Hair 1-P usually 3-branched (2-3); 2-P single; 3-P double; 4-P single; 5, 7-P usually double (1-2); 6-P single; 9-P single; 11-P single; 5, 7-M single; 6-M 2-branched; 8-M with 2-3 branches; 9-M single, long, stout and barbed; 10, 12-M single, long, more slender than 9-M, barbed; 11-M single; 7-T with 2-3 branches; 9, 10 and 11-T similar to those on mesothorax; 12-T much reduced; basal spine of meso- and metapleural hairs long, straight and pointed at tip. *Abdomen*. Hair 6-I, II 2-branched; 7-I single; 7-II 2-branched;



*Aedes (Stegomyia) malikuli* n. sp.

Fig. 2. *Aedes (Stegomyia) malikuli* n. sp. fourth instar larva: A, dorsoventral aspect of the head; B, dorsoventral aspect of the thorax and abdomen; C, lateral aspect of the terminal abdominal segments.

6-III-V 2-branched, one more slender than the other; 7-III with 4-5 branches; 6-VI single; 1-VII usually with 3 branches, barbed; 2-VII 3-branched; comb of 5 scales in a row, arising from a sclerotized plate, each scale with fine denticles at the base of the apical spine; pentad hair 2-VIII distant from 1-VIII; 1, 5-VIII

3-branched; 3-VIII with 3-4 branches; 2, 4-VIII single; siphon about 3 times as long as wide, acus absent; pecten teeth 10-18 in number, evenly spaced, each tooth with 3-5 basal denticles; 1-S with 2-3 branches, inserted beyond last tooth and in line with the teeth; saddle incomplete; marginal spicules long and conspicuous; 1-X 2-branched; 2-X single; 3-X single; ventral brush with 4 pairs of hairs on grid, each hair single; no precratal tufts; anal papillae about 3 times as long as saddle, sausage-like.

**TYPE DATA.** Holotype male (04482-10) with associated larval and pupal skins and terminalia slide (73/103), Huai Phrao, *Chiang Mai*, THAILAND, collected as a larva in a small tree hole, partially shaded, in a secondary deciduous forest in the mountains, altitude 1290 ft., VII-10-1970 (Chaliou & Anun). Deposited in the U.S. National Museum. Paratypes: 7 males as follows: 1 male (04482-14) with associated larval and pupal skins and terminalia slide (73/105), with same data as holotype; 1 male (00136-22) with associated larval and pupal skins and terminalia slide (68/161), Huai Mae Nam Noi, *Kanchanaburi*, THAILAND, collected as a larva in a bamboo internode, on ground, heavily shaded, in a bamboo grove in the mountains, altitude 350 ft., V-25-1965 (Peyton); 2 males (00314-102, 103) with associated pupal skins and terminalia slides (68/1013, 68/433), Doi Sam Sao, *Tak*, THAILAND, collected as pupae in a bamboo internode, 3 ft. above ground level, in a primary rain forest in the mountains, altitude 1500 ft., VIII-1-1965 (Somboon); 1 male (00315-102) with associated pupal skin and terminalia slide (68/432), Khao Salak Phra, *Tak*, THAILAND, collected as a pupa in a bamboo stump, 6 ft. above ground level, partially shaded, near the stream, in a primary rain forest in the mountains, altitude 1500 ft., VIII-1-1965 (Somboon); 2 males (00320-2, 100) with associated larval and pupal skins and terminalia slides (68/434, 68/485), Doi Sam Sao, *Tak*, THAILAND, collected as a larva or pupa in a small stream pool, with abundant dead leaves, partially shaded, in a primary rain forest in the mountains, altitude 2400 ft., VIII-2-1965 (Kol). Deposited in the U.S. National Museum and British Museum.

**DISTRIBUTION.** 30 specimens examined: 9♂, 9♂ terminalia, 8 individual rearings (4 l, 8 p).

**THAILAND.** *Chiang Mai:* Huai Phrao (VII-1970, Chaliou & Anun), 2♂, 2♂ terminalia, 2 individual rearings (2 l, 2 p); *Kanchanaburi:* Huai Mae Nam Noi (V-1965, Peyton), 1♂, 1♂ terminalia, 1 individual rearing (1 l, 1 p); *Tak:* Doi Sam Sao (VIII-1965, Somboon), 2♂, 2♂ terminalia, 2 individual rearings (2 p); (VIII-1965, Kol), 2♂, 2♂ terminalia, 2 individual rearings (1 l, 2 p); Khao Salak Phra (VIII-1965, Somboon), 1♂, 1♂ terminalia, 1 individual rearing (1 p).

**TAIWAN.** *Taichung:* Sun Moon Lake (VI-1-1948), 1♂, 1♂ terminalia.

**TAXONOMIC DISCUSSION.** *Aedes* (*Stegomyia*) *malikuli* n. sp., a member of the *mediopunctatus* subgroup, is extremely similar to other members of the subgroup. However, the male terminalia of *malikuli*, having the claspette of the basimere simple with numerous long setae on the slightly expanded distal part and with few shorter ones on sternal side, are different from all other species that have been described.

Based on the present collection data *malikuli* is a mountain species extremely similar to *perplexus* (Leicester) which is widespread in Thailand. Both species have been collected as larvae in the same tree hole from Chiang Mai area. At present, I am unable to find any reliable characters to separate them in all stages except male terminalia. It is hoped that more material will be available to us and that further reliable diagnostic characters might be found.

**BIOLOGY.** The immature stages of *malikuli* were collected in bamboo internodes, in a bamboo stump, in a tree hole and in a stream pool in Thailand. The larvae from Chiang Mai were associated with other members of the *w-albus* group (*mediopunctatus* subgroup and *annandalei* subgroup).

#### NOTES ON THE *mediopunctatus* SUBGROUP

*Aedes* (*Stegomyia*) *mediopunctatus* (Theobald) was originally assigned to Group C (*scutellaris* group) by Edwards (1932). Knight & Hurlbut (1949) subdivided the *scutellaris* group into 3 subgroups known as Subgroup I (*scutellaris* s. str.), Subgroup II (*albopictus*), and Subgroup III (*mediopunctatus*). Mattingly (1965) transferred *mediopunctatus* from Group C to Group B (*w-albus* group). Based on the rather strikingly differentiated characters the *mediopunctatus* subgroup can easily be separated from all the members of the *scutellaris* and *albopictus* subgroups in all stages. Therefore it should be recognized as a distinct subgroup and placed under a different group. I am following Mattingly (1965) in considering *mediopunctatus* as belonging to the *w-albus* group.

The *mediopunctatus* subgroup can be distinguished from other *Stegomyia* by the following combination of characters: palpi with white scales; scutum with the median longitudinal white stripe broader than usual, extending from anterior margin, tapering posteriorly and forking at the beginning of prescutellar space; hind tarsus with tarso-mere 3 all dark.

Members of the *mediopunctatus* subgroup are extremely variable and difficult to separate in all stages except for the male terminalia. At present, three distinct forms of the claspette are found: (1) *perplexus* form, (2) *submediopunctatus* form; and (3) *malikuli* form. Thus, at least three species are recognizable within this subgroup and

all are found within the Southeast Asia area. The diagnostic characters and known distribution (based on the specimens which have been examined by me) of the species of the *mediopunctatus* subgroup are summarized below.

SPECIES	MALE DIAGONSTIC CHARACTERS	DISTRIBUTION
<i>mediopunctatus</i> (Theobald) 1905	Male unknown.	Ceylon (Peradeniya) type locality only.
<i>perplexus</i> (Leicester) 1908	Claspette bilobed with setae on sternal portion shorter and flattened, one of them stouter than the rest.	West Malaysia, Thailand.
<i>submediopunctatus</i> (Barraud) 1923	Claspette as <i>perplexus</i> form except tergal portion with several distinctly long and stout setae.	India, Philippines.
<i>malikuli</i> n. sp.	Claspette simple, with numer- ous long setae on the slightly expanded distal part and with few shorter ones on sternal side.	Thailand, Taiwan.

Theobald (1905) described *mediopunctatus* species from a single female from Peradeniya, Ceylon. Thus, the true identity of this species cannot be ascertained until a topotype male becomes available.

The Indian specimens previously described as *mediopunctatus* (Theobald), *mediopunctatus* var. *submediopunctatus* (Barraud) and *mediopunctatus* var. *sureilensis* Barraud by Barraud (1923, 1934) as well as the Philippine specimens previously described as *mediopunctatus* var. *perplexus* (Leicester) by Knight & Hull (1952) are all *submediopunctatus*. However, when the topotypic male of *mediopunctatus* from Ceylon becomes available, it may well prove that *submediopunctatus* is a synonym. The discontinuous distribution of this species is rather unusual. Specimens of this subgroup from parts of Southeast Asia such as China (S. of Yangtze Kiang), Hong Kong, Hainan, Viet Nam, Laos, Cambodia and Burma, which are totally lacking in all collections, may help to answer the question if they become available.

*Stegomyia perplexus* was originally described by Leicester (1908: 83) as a distinct species from Kuala Lumpur, Malaya. Barraud (1934: 231) considered it to be a variety of *mediopunctatus* (Theobald) in having the 4th and 5th hind tarsal segments entirely white and



Mattingly (1965:46) treated as a subspecies. It is here elevated back to full species rank.

It is now difficult to say what Lien's (1962) record of *mediopunctatus* var. *perplexus* (Leicester) represents. My only Taiwan male specimen (from the Bishop Museum) of the subgroup is *malikuli* n. sp. It is possible that either *submediopunctatus* or *perplexus* is also present in Taiwan. However, no conclusion can be made without examination of Taiwan specimens which are not available to us.

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